ENGINEERED
INSPECTION
SYSTEMS

TEL: (502) 955-9021
(800) 595-1332
FAX: (502) 955-7589

P.O. BOX 40 / 3259 CORAL RIDGE ROAD / BROOKS, KY 40109 / USA

WWW.ENGINEEREDINSPECTION.COM

258774

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RSPA-03-14405-7

Docket Management System
U. S. Dept. of Transportation
400 Seventh Street SW
Nassif Building, Room PL-401
Washington, DC 20590-001

Reference: RSPA-03-14405 (HM-220F) for Code 49 CFR, Parts 171, 173, and 180

Gentlemen:

This letter is sent in reference to the proposed docket number RSPA-03-14405 (HM-220F) for Code 49 CFR, Parts 171, 173, and 180 of the Department of Transportation. Engineered Inspection Systems has been a manufacturer of eddy current nondestructive test equipment since 1987 but has performed testing in the eddy current field since our inception in 1981. Our company has manufactured hundreds of eddy current units for various applications throughout the years, and our equipment is located worldwide. Among the equipment which we have designed and sold is our Simple Eddy unit which has been used successfully to locate the defects for which this specification was intended.

In addition to our manufacturing experience, our chief design engineer has worked in the eddy current field since the late 1960s. During the 1980s and 1990s we were a licensed FAA repair station which performed eddy current testing on aircraft. This year we also received our license as an approved hydrotest facility for cylinders. We believe that our experience in the nondestructive test field more than determines our qualifications to be able to comment on the proposed procedures referenced above.

We would like to state our objections to the code as written and suggest some modifications that would make the code more understandable and more cohesive with standard specifications used in industry. Our specific concerns are as follows:

1. In Appendix C to Part 180 Paragraph 2 of the standard, specific brand names of eddy current equipment are listed. This is not normal in industry and is not a professional way to approach the composition of a standard to which all testing agencies must adhere. As a government standard, this document should not contain the names of any specific manufacturers or equipment. There are numerous companies which manufacture eddy current equipment that can perform this type of inspection.

2. Appendix C to Part 180 Paragraph 3: the term "reference ring" is not used in the nondestructive test field. The proper terminology is "reference standard". The wording of the specification is important because the code must be clear to all test agencies, and standard terminology should be used in order to achieve this goal.

Also, we do not understand the requirement for the equipment manufacturer to provide a drawing of the reference standard. This is not usually done and seems unnecessary. Further, it is proprietary information that does not need to be provided to a customer as it does not serve any purpose for them.

Comment: Drilled holes, saw cuts, file cuts and EDM (electric discharge machine) notches have been used for many years in industry. Their main function is to provide an operator or manufacturer a method to verify the test instruments capability to detect narrowly defined artificial flaws which through empirical research have been shown to give results representative of natural discontinuities which are harmful to the product being manufactured. They also allow a method to repeatedly and reliably create these representative conditions. This is due to the fact that natural defects are not repeatedly reproducible with any degree of accuracy.

Even the definition of the defect this standard is attempting to define is not precise. In addition to a length (which has been defined), there is also a width and depth to the defect, neither of which has been included. These variables can have a very large effect on the result an eddy current machine will see.

In actual practice artificial EDM (electric discharge machine) notches can be more difficult to detect than natural discontinuities. Based on our research, we have determined that an EDM notch .010" wide through the threads to the root is more than sufficient to simulate sustained load cracks of two thread lengths. Due to the sensor field width, the length of the EDM notch is unimportant. A longer EDM notch does allow lower cost of production and a lower price to the end user. It also simplifies the set-up for the operator of the equipment. We have also noted that the reference standard can be manufactured with 6061 material. Lacking a precise definition of the reference standard, this paragraph should state that a reference standard for performing the test be capable of ensuring the detection of SLCs that are two thread lengths long. Both our competitors in this market use a different standard than us, and all achieve the same goal.

3. In Appendix C to Part 180 Paragraph 4 the term "equipment standardization" is not used in the nondestructive test field. The proper terminology is "equipment calibration".

4. Appendix C to Part 180 Paragraph 4 steps i thru vi are not correct for most eddy current equipment. Some of the information listed is very outdated or totally inaccurate. For instance, in sub ii, there is no need to warm up any properly designed eddy current unit, especially for an unreasonable amount of time like the twenty minutes referenced in the proposed code. For example, most units are stabilized and functional in typically less than thirty seconds in temperatures ranging from 0° – 40° C. (The only temperature concern could be take a machine

from a very cold environment into a heated one where condensation would be a consideration. This is not a normal situation for retest facilities.)

Additionally, defects can be detected at various frequencies with eddy currents. Therefore, a specific frequency range should not be stated or it should be made much broader. Through our research, we have found that 50 kHz is the best choice for aluminum for the detection of the defects sought. This is based on a compromise for the best signal/noise ratio, detection of both surface and sub-surface defects, probe design used and signal processing in the unit. It allowed us to address concerns we were aware of early on in the design process which were subsequently pointed out in the Research and Special Projects report under contract # SP00700-97-D-4003 as noted on pg 37 bottom paragraph. (i.e. false signals, operator level of competency and operator signal interpretation.)

All that needs to be made clear in this paragraph is that the reference standard must be used to test the probe and equipment initially to verify that the manufactured defect can be located as per manufactures recommendations. Only after detection of the discontinuity has been established with the reference standard should testing of actual cylinders take place.

5. Appendix C to Part 180 Paragraph 4; the specific operation procedures for the eddy current equipment should not be stated. Operation varies between equipment types as there are many ways to achieve the same results. By detailing the exact steps to be followed and describing how the probe must be handled, how the defect signal should look, etc., you are in essence stating that only one manufacturer's equipment is acceptable for the test. This is not the duty of a standard unless there is in fact only one machine that can perform the function. The term "spike" should be changed to the more correct term "indication". The term "spike" indicates either a B scan display or polar display. Some units use an amplitude display such as a bargraph and others an X-Y plot. Since there are numerous eddy current manufacturers who could provide equipment to perform this test, proper terminology should be used.

It is important to note that the application for which you are specifying the use of eddy currents is one that is a straightforward inspection which has been conducted for many years. It imitates the probe inspection which has been used to test aircraft structures for sustained load and stress cracks, especially in bolt hole areas. The main reason there are not more eddy current units being marketed for inspection of cylinders is not that they are incapable of performing the test; it is strictly a case of economics. Most eddy current units cost from two to ten times more than those currently being sold to perform this inspection. It would not be feasible for most small companies currently performing this service as part of an annual visual inspection to purchase equipment in this price range.

6. Appendix C to Part 180 Paragraph 5; as stated above, the specific operation procedures for using the eddy current equipment should not be detailed. All equipment varies in the exact operational steps to be followed. Reference should be made to set-up and calibration of the machine per manufacturer's recommendations for each size cylinder to be inspected.

Reference should be made that the minimum size of the crack which constitutes a defect is two threads and that the results of the eddy current test should be confirmed with a visual inspection conducted immediately afterwards.

We hope our suggestions are useful to you as you determine the final version of the standard. Should you have any questions or need any other information, please do not hesitate to contact us.

Sincerely,

Dale L. Bletso
President